plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner, in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements, consecutive ones of the heating elements being disposed sufficiently adjacent to one another to cause cross-talk therebetween; and

recording means for ejecting ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplets on the recording medium, thus recording dots made of the ink droplets.

REMARKS

This is a full and timely response to the final Official Action mailed February 20, 2003. Reexamination and reconsideration in light of the above amendments and the following remarks are courteously requested.

Claims 1-36 are pending in the application. By this Response, claim 4 is amended.

Entry of the Amendment is proper under 37 C.F.R. §1.116 because the Response: a) places the application in condition for allowance for the reasons discussed herein; b) does not raise any new issue requiring further search and/or consideration because the Response amplifies issues previously discussed throughout prosecution; c) does not present any additional claims without canceling a corresponding number of finally rejected claims; and d) places the application in better form for appeal, should an Appeal be necessary. The Response is necessary and was not earlier presented because it is made in response to arguments raised in the final rejection. The amendments to the subject claim do not incorporate any new subject matter into the claims. Thus, entry of the Response is respectfully requested.

Claims 1-9 are rejected under 35 U.S.C. 102(b) as unpatentable over Ayata et al. (U.S. Patent No. 4,463,359). The rejection is respectively traversed.

Claim 1 is directed to a method for driving a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of

nozzles. Claim 1 recites a time-division driving step that drives the plurality of heating elements into a plurality of blocks with each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles. Claim 1 further recites that each set of the heating elements simultaneously driven over the respective blocks is sequentially driven in a time-divisional manner in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements.

Claim 4 is directed to a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles with the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium. Claim 4 recites that the recording head includes time-division driving means for dividing the plurality of heating elements into a plurality of blocks with each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner, in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements. Claim 4 also recites that consecutive ones of the heating elements are disposed sufficiently adjacent to one another to cause cross-talk therebetween. Claim 4 further recites that the recording head includes recording means for ejecting ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplets on the recording medium, thus recording dots made of the ink droplets.

Ayata discloses time-division drive. However, in Ayata, time-division drive for each block is shifted between adjacent blocks as shown in Figure 24 in which PP1, PP9, PP17 and PP25 are driven, PP2, PP10, PP18 and PP26 are driven next, which are nozzles adjacent to the previous nozzles in the respective blocks. On the contrary, the claimed invention discloses that in time-division drive carried out for each block, not only the adjacent nozzles in the respective blocks are driven next but also the driving order is shuffled. In the specification on page 20, lines 2-5, it states "in order to avoid

the influence of cross-talk due to the driving of the adjacent heating elements, the driving order may be changed so that the distant heating elements are driven next." It is respectfully submitted that this feature is not disclosed in Ayata.

The Office Action indicates that Ayata, in column 15, lines 17-45 in column 23, lines 26-39, discloses "in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements." (See Detailed Action on page 2, fourth to the second lines from the bottom).

First, with regard to column 15, lines 17-45, it is obvious, as shown in Figure 24 of Ayata, that PP1, PP9, PP17 and PP25 are driven simultaneously in a time-division driving, and in a subsequent drive, PP2, PP10, PP18 and PP26 are driven simultaneously. Accordingly, in a time-division driving, it is disclosed that adjacent heating elements are driven in order.

As well as column 23, lines 26-39, in the embodiment, as shown in Figure 42, 2048 heating elements are divided into 4 blocks, each containing 512 nozzles. The 512 heating elements in each block are divided into 16 groups of 32 nozzles, for effective time-divided drive with a duty ratio of 1/16, and each block discloses the structure which drives 32 nozzles simultaneously.

Therefore, it is respectfully submitted that column 23, lines 26-39, fails to disclose the contents "in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements" as recited in claims 1 and 4.

It is respectfully submitted that the rejection is improper because the applied art fails to teach each element of claims 1 and 4. Specifically, the applied art fails to teach that each set of the heating elements simultaneously driven over the respective blocks is sequentially driven in a time-divisional manner in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements. Thus, it is respectively submitted that claims 1 and 4 are allowable over the applied art.

Claim 7 is directed to an ink jet printer having a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of

nozzles. Claim 7 recites time-division driving means for dividing the plurality of heating elements into a plurality of blocks with each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles. Claim 7 further recites that each set of heating elements simultaneously driven over the respective blocks is sequentially driven in a time-divisional manner with the plurality of blocks arranged in first and second rows extending in a sub scanning direction and spaced apart from one another in a main scanning direction to form a zigzag array with end ones of the nozzles in the blocks in the first row overlapping end ones of the nozzles in the blocks in the second row.

Ayata discloses an example of a zigzag array of ink jet blocks (i.e. head chips) as shown in Figure 18 but the ink jet blocks do not overlap each other.

It is respectfully submitted that the rejection is improper because the applied art fails to teach each element of claim 7. Specifically, the applied art fails to teach that each set of heating elements simultaneously driven over the respective blocks is sequentially driven in a time-divisional manner with the plurality of blocks arranged in first and second rows extending in a sub scanning direction and spaced apart from one another in a main scanning direction to form a zigzag array with end ones of the nozzles in the blocks in the first row overlapping end ones of the nozzles in the blocks in the second row. Thus, it is respectfully submitted that claim 7 is allowable over the applied art.

Claims 2 and 3 depend from claim 1 and include all of the features of claim 1. Claims 5 and 6 depend from claim 4 and include all of the features of claim 4. Claims 8 and 9 depend from claim 7 and include all of the features of claim 7. Thus, it is respectfully submitted that the dependent claims are allowable at least for the reasons the independent claims are allowable as well as for the features they recite.

Withdrawal of the rejection is respectfully requested.

Claims 10-15, 18-24, 27-33 and 36 are rejected under 35 U.S.C. 103(a) as unpatentable over Ayata in view of Sekiya (U.S. Patent No. 5,877,786). The rejection is respectfully traversed.

Claim 10 is directed to a method for driving a recording head having a plurality of

heating elements as driving elements for ejecting ink droplets from a plurality of nozzles. Claim 10 recites a correcting unevenness step of correcting unevenness of print density by controlling pulse number modulation.

Sekiya discloses the concept of pulse number modulation control and also discloses that when T represents the time for maximum bubbles to be formed from the application of a pulse, the next pulse application should be 4T after the previous pulse application in order to stabilize ink ejection (see column 11, line 57 to column 12, line 2). However, Sekiya fails to disclose correction of the pulse number for pulse number modulation control in consideration of the difference in quantity of ejection between the respective nozzles. Sekiya describes in column 14, lines 6-8, that the pulse number should not be excessively increased in consideration of the printing speed. Therefore, Sekiya does not disclose the concept of correction of the pulse number.

It is respectfully submitted that none of the applied art, alone or in combination, teaches or suggests the features of claim 10. Specifically, none of the applied art teaches or suggests a correcting unevenness step of correcting unevenness of print density by controlling pulse number modulation. Thus, one of ordinary skill in the art would not be motivated to combine the features of the applied art because such combination would not result in the claimed invention. Therefore, it is respectfully submitted that claim 10 is allowable over the applied art.

Claim 19 is directed to a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles. Claim 19 recites distribution means for distributing the ejecting ink droplets on the carried recording medium using phase-corresponding data with respect to pulse numbers so that the resultant blocks formed thereon are oriented generally centrally about respective imaginary lattice points defining imaginary horizontal and vertical grid lines on the carried recording medium.

Sekiya describes a technique for matching the center position of a pixel and the center position of an ink drop as described in column 16, lines 35-41. However, Sekiya only discloses a technique in which the pulse application timing is delayed when the pulse number is small. On the contrary, the claimed invention employs a different

technique for matching the center position of a pixel and the center position of an ink drop by a distribution means recited above.

It is respectfully submitted that none of the applied art, alone or in combination, teaches or suggests the features of claim 19. In particular, none of the applied art teaches or suggests distribution means for distributing the ejected ink drops on the carried recording medium as recited in claim 19. Thus, one of ordinary skill in the art would not be motivated to combine the teachings of the applied art because such combination would not result in the claimed invention. Therefore, claim 19 is allowable over the applied art.

Claim 28 is directed to an ink jet printer having a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles. Claim 28 recites correcting means for correcting unevenness of print density by controlling pulse number modulation.

For similar reasons discussed above for claim 10, it is respectfully submitted that none of the applied art alone or in combination, teaches or suggests the features of claim 28. Specifically, none of the applied art teaches or suggests correcting means for correcting unevenness of print density by controlling pulse number modulation. As a result, one of ordinary skill in the art would not be motivated to combine the features of the applied art because such combination would not result in the claimed invention. Therefore, claim 28 is allowable over the applied art.

Claims 11-15 and 18 depend from claim 10 and include all of the features of claim 10. Claims 20-24 and 27 depend from claim 19 and include all of the features of claim 19. Claims 29-33 and 36 depend from claim 28 and include all of the features of claim 28. Thus, the dependent claims are allowable at least for the reasons the independent claims are allowable as well as for the features they recite.

For instance, claims 13 and 14 include features not shown in the applied art. Claim 13 recites that, at a drive signal generating step, the order of the pulses to be objects of comparison with the record data is determined so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is

the position on the recording medium in forming one dot with one ink droplet.

Claim 14 recites that, at the drive signal generating step, in the case of forming one dot with the ink droplets of even ordinal numbers, the order of the pulses to be objects of comparison with the record data is determined so that the resulting dot is equivalent to a dot formed by distributing the ink droplets of odd ordinal numbers and the droplets of the even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center.

In the claimed invention, pulse number modulation control is carried out in consideration of whether the pulse number is even or odd as discussed in the specification commencing on page 46, line 2 and in Figs. 24-32. The features of claims 13 and 14 are not disclosed in Sekiya. In Sekiya, only the application timing is delayed when the pulse number is small. In Sekiya, whether the pulse number is even or odd is not a problem as described in column 17, lines 21-22. In the claimed invention, whether the pulse number is even or odd is problematic.

As discussed above, it is respectfully submitted that claims 13 and 14 are allowable over the applied art for these additional reasons.

Withdrawal of the rejection is respectfully requested.

In view of the foregoing, reconsideration of the application and allowance of the pending claims are respectfully requested. Should the Examiner believe anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' representative at the telephone number listed below.

Should additional fees be necessary in connection with the filing of this paper or if a Petition for Extension of Time is required for timely acceptance of the same, the Commissioner is hereby authorized to charge Deposit Account No. 18-0013 for any such fees and Applicant(s) hereby petition for such extension of time.

Respectfully submitted,

Date: May 2, 2003

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Enclosures: Appendix I (Marked-Up Version of Amended Claim 4)

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APPENDIX I

(MARKED-UP VERSION OF AMENDED CLAIM 4)

For the convenience of the Examiner, all of the pending claims are hereby presented.

1. A method for driving a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the method comprising:

a time-division driving step of dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements; and

a recording step of ejecting ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplets on the recording medium, thus recording dots made of the ink droplets.

2. The method for driving a recording head as claimed in claim 1, wherein at the time-division driving step, the heating elements are driven on the basis of a division dive signal generated for said each set and an element drive signal, which is a signal for driving the heating elements and is made up of necessary data for forming one dot.

3. The method for driving a recording head as claimed in claim 2, wherein at the time-division driving step, the division drive signals corresponding to the number of time divisions are generated by multi-dimensional input signals.

4. (Twice Amended) A recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to

the direction of carrying a carried recording medium, the recording head comprising:

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner, in a driving order so that non-adjacent heating elements are driven next to avoid cross-talk due to driving adjacent heating elements, consecutive ones of the heating elements being disposed sufficiently adjacent to one another to cause cross-talk therebetween; and

recording means for ejecting ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplets on the recording medium, thus recording dots made of the ink droplets.

5. The recording head as claimed in claim 4, wherein the time-division driving means drives the heating elements on the basis of a division dive signal generated for said each set and an element drive signal, which is a signal for driving the heating elements and is made up of necessary data for forming one dot.

6. The recording head as claimed in claim 5, wherein the time-division driving means generates the division drive signals corresponding to the number of time divisions by multi-dimensional input signals.

7. An ink jet printer having a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the ink jet printer being adapted for recording information including a character and/or an image in the form of dots made of ink droplets, the ink jet printer comprising:

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially

arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner, the plurality of blocks arranged in first and second rows extending in a sub scanning direction and spaced apart from one another in a main scanning direction to form a zigzag array with end ones of the nozzles in the blocks in the first row overlapping end ones of the nozzles in the blocks in the second row; and

recording means for ejecting ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplets on the recording medium, thus recording dots made of the ink droplets.

8. The ink jet printer as claimed in claim 7, wherein the time-division driving means drives the heating elements on the basis of a division dive signal generated for said each set and an element drive signal, which is a signal for driving the heating elements and is made up of necessary data for forming one dot.

9. The ink jet printer as claimed in claim 8, wherein the time-division driving means generates the division drive signals corresponding to the number of time divisions by multi-dimensional input signals.

10. A method for driving a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the method comprising:

a drive signal generating step of generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot;

a time-division driving step of dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements

simultaneously driven over the respective blocks, in a time-divisional manner;

a correcting unevenness step of correcting unevenness of print density by controlling pulse number moderation; and

a recording step of ejecting one or a plurality of ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s).

11. The method for driving a recording head as claimed in claim 10, wherein at the time-division driving step, the heating elements are driven on the basis of a division dive signal generated for said each set and an element drive signal generated at the drive signal generating step for driving the heating elements belonging to said set designated by the division drive signal.

12. The method for driving a recording head as claimed in claim 10, wherein at the drive signal generating step, record data made up of necessary data for forming one dot is compared with the number of pulses generated for determining the number of said ink droplets to be ejected from the nozzles, and the result of comparison is outputted as the element drive signal.

13. The method for driving a recording head as claimed in claim 12, wherein at the drive signal generating step, the order of the pulses to be objects of comparison with the record data is determined so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

14. The method for driving a recording head as claimed in claim 13, wherein at the drive signal generating step,

in the case of forming one dot with the ink droplets of even ordinal numbers, the order of the pulses to be objects of comparison with the record data is determined so that the resultant dot is equivalent to a dot formed by distributing the ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center, and

in the case of forming one dot with the ink droplets of odd ordinal numbers, the order of the pulses to be objects of comparison with the record data is determined so that the resultant dot is equivalent to a dot formed by impacting the first ink droplet on the lattice point and then distributing the ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center.

15. The method for driving a recording head as claimed in claim 13, wherein at the recording step, recording is carried out while the position on the recording medium where the ink droplet should be impacted is changed in accordance with the number of pulses generated at the drive signal generating step.

16. A method for driving a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the method comprising:

a drive signal generating step of generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot;

a time-division driving step of dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner; and

a recording step of ejecting one or a plurality of ink droplets from the

nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s),

wherein at the drive signal generating step, record data made up of necessary data for forming one dot is compared with the number of pulses generated for determining the number of said ink droplets to be ejected from the nozzles, and the result of comparison is outputted as the element drive signal, and

wherein at the drive signal generating step, the record data is temporally divided into two, and the order of the pulses to be objects of comparison with the former half record data of the record data divided into two is determined so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

17. The method for driving a recording head as claimed in claim 16, wherein at the drive signal generating step, the order of the pulses to be objects of comparison with the latter half record data is determined so that record data based on the pulses of odd ordinal numbers and record data based the pulses of even ordinal numbers are arranged on the opposite sides of the lattice point to the former half record data.

18. The method for driving a recording head as claimed in claim 11, wherein at the time-division driving step, the division drive signals corresponding to the number of time divisions are generated by multi-dimensional input signals.

19. A recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the recording head comprising:

drive signal generating means for generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot;

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner;

distribution means for distributing the ejected ink drops on the carried recording medium using phase-corresponding data with respect to pulse numbers so that resultant dots formed thereon are oriented generally centrally about respective imaginary lattice points defining imaginary horizontal and vertical grid lines on the carried recording medium; and

recording means for ejecting one or a plurality of ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s).

20. The recording head as claimed in claim 19, wherein the time-division driving means drives the heating elements on the basis of a division dive signal generated for said each set and an element drive signal generated by the drive signal generating means for driving the heating elements belonging to said set designated by the division drive signal.

21. The recording head as claimed in claim 19, wherein the drive signal generating means has:

storage means for storing record data made up of necessary data for forming one dot;

pulse generating means for generating pulses for determining the number of said ink droplets to be ejected from the nozzles; and

comparing means for comparing the record data stored in the storage means with the number of pulses generated by the pulse generating means;

the drive signal generating means outputting the result of comparison made by the comparing means as the element drive signal.

22. The recording head as claimed in claim 21, wherein the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

23. The recording head as claimed in claim 22, wherein in the case of forming one dot with the ink droplets of even ordinal numbers, the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that the resultant dot is equivalent to a dot formed by distributing the ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center, and

in the case of forming one dot with the ink droplets of odd ordinal numbers, the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that the resultant dot is equivalent to a dot formed by impacting the first ink droplet on the lattice point and then distributing the ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center.

24. The recording head as claimed in claim 22, wherein the recording means carries out recording while changing the position on the recording medium where the ink droplet should be impacted, in accordance with the number of pulses generated by the drive signal generating means.

25. A recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the recording head comprising:

drive signal generating means for generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot, the drive signal generating means having:

storage means for storing record data made up of necessary data for forming one dot;

pulse generating means for generating pulses for determining the number of said ink droplets to be ejected from the nozzles; and

comparing means for comparing the record data stored in the storage means with the number of pulses generated by the pulse generating means;

the drive signal generating means outputting the result of comparison made by the comparing means as the element drive signal;

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner; and

recording means for ejecting one or a plurality of ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s), wherein the drive signal generating means temporally divides the record data is temporally divided into two and determines the order of the pulses to be objects of comparison with the former half record data of the record data divided into two so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

26. The recording head as claimed in claim 25, wherein the drive signal generating means determines the order of the pulses to be objects of comparison with the latter half record data so that record data based on the pulses of odd ordinal

numbers and record data based the pulses of even ordinal numbers are arranged on the opposite sides of the lattice point to the former half record data.

27. The recording head as claimed in claim 20, wherein the time-division driving means generates the division drive signals corresponding to the number of time divisions by multi-dimensional input signals.

28. An ink jet printer having a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the ink jet printer being adapted for recording information including a character and/or an image in the form of dots made of ink droplets, the ink jet printer comprising:

drive signal generating means for generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot;

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner;

correcting means for correcting unevenness of print density by controlling pulse number modulation; and

recording means of ejecting one or a plurality of ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s).

29. The ink jet printer as claimed in claim 28, wherein the time-division driving means drives the heating elements on the basis of a division dive signal generated for said each set and an element drive signal generated by the drive signal generating means for driving the heating elements belonging to said set designated by the division

drive signal.

30. The ink jet printer as claimed in claim 28, wherein the drive signal generating means has:

storage means for storing record data made up of necessary data for forming one dot;

pulse generating means for generating pulses for determining the number of said ink droplets to be ejected from the nozzles; and

comparing means for comparing the record data stored in the storage means with the number of pulses generated by the pulse generating means;

the drive signal generating means outputting the result of comparison made by the comparing means as the element drive signal.

31. The ink jet printer as claimed in claim 30, wherein the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

32. The ink jet printer as claimed in claim 31, wherein in the case of forming one dot with the ink droplets of even ordinal numbers, the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that the resultant dot is equivalent to a dot formed by distributing the ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center, and

in the case of forming one dot with the ink droplets of odd ordinal numbers, the drive signal generating means determines the order of the pulses to be objects of comparison with the record data so that the resultant dot is equivalent to a dot formed by impacting the first ink droplet on the lattice point and then distributing the

ink droplets of odd ordinal numbers and the ink droplets of even ordinal numbers in the direction of carrying the recording medium symmetrically about the lattice point as the center.

33. The ink jet printer as claimed in claim 31, wherein the recording means carries out recording while changing the position on the recording medium where the ink droplet should be impacted, in accordance with the number of pulses generated by the drive signal generating means.

34. A ink jet printer having a recording head having a plurality of heating elements as driving elements for ejecting ink droplets from a plurality of nozzles, the plurality of heating elements being arranged in a direction substantially perpendicular to the direction of carrying a carried recording medium, the ink jet printer being adapted for recording information including a character and/or an image in the form of dots made of ink droplets, the ink jet printer comprising:

drive signal generating means for generating an element drive signal made of necessary data for forming one dot so as to modulate the diameter of a dot by the number of ink droplets, using one or a plurality of ink droplets for forming one dot;

time-division driving means for dividing the plurality of heating elements into a plurality of blocks, each block consisting of a predetermined number of spatially arranged heating elements of the plurality of heating elements corresponding to the plurality of nozzles, and sequentially driving each set of heating elements simultaneously driven over the respective blocks, in a time-divisional manner; and

recording means of ejecting one or a plurality of ink droplets from the nozzles corresponding to the driven heating elements and impacting the ink droplet(s) on the recording medium, thus recording dots made of the ink droplet(s);

wherein the drive signal generating means has:

storage means for storing record data made up of necessary data for forming one dot;

pulse generating means for generating pulses for determining the number of said ink droplets to be ejected from the nozzles; and

comparing means for comparing the record data stored in the storage means with the number of pulses generated by the pulse generating means;
the drive signal generating means outputting the result of comparison made by the comparing means as the element drive signal; and

wherein the drive signal generating means temporally divides the record data is temporally divided into two and determines the order of the pulses to be objects of comparison with the former half record data of the record data divided into two so that a dot to be formed on the recording medium is equivalent to a dot formed by distributing the ink droplets in the direction of carrying the recording medium from a lattice point as the center, which is the position on the recording medium in forming one dot with one said ink droplet.

35. The ink jet printer as claimed in claim 34, wherein the drive signal generating means determines the order of the pulses to be objects of comparison with the latter half record data so that record data based on the pulses of odd ordinal numbers and record data based the pulses of even ordinal numbers are arranged on the opposite sides of the lattice point to the former half record data.

36. The ink jet printer as claimed in claim 29, wherein the time-division driving means generates the division drive signals corresponding to the number of time divisions by multi-dimensional input signals.